REMARKS

Claims 1-2 and 4-11 are currently pending in the present application. Claim 3 was canceled without prejudice or disclaimer in a prior response. Accordingly, claims 1-2 and 4-11 are currently under consideration.

Applicant has amended the claims to more clearly distinguish the art of record. Accordingly, entry of this amendment and favorable consideration are respectfully solicited.

Claims 1-2, 4 and 8 have been amended. In particular, claim 1 has been amended to recite that the amount of hydrogen ion conductive polymer electrolyte varies seamlessly in a thickness direction of the anode or cathode. Claim 2 has been amended to recite that both anode and cathode have a seamlessly varying amount of the electrolyte. Claim 8 has also been amended to recite that the catalyst layer is formed in which the amount of electrolyte varies seamlessly in a thickness direction. Support for these amendments can be found throughout the detailed specification as, for example, on page 18, first full paragraph of the present specification.

Claim 4 has been amended to independent form and also to recite that the layer of the catalyst layer "consists of" a hydrogen ion conductive polymer electrolyte. Accordingly, entry of these amendments are respectfully solicited.

Rejection under 35 U.S.C. 102

Claims 1-2, 8-11 were rejected under 35 U.S.C. 102(e) as being anticipated by JP 09-245802 to Tomoyuki. The rejection is traversed and it is respectfully submitted that claims 1-2, 8-11 are patentable within the meaning of 35 U.S.C. 102(e).

Independent claim 1 relates to a polymer electrolyte fuel cell. It comprises a membrane; and an anode and a cathode sandwiching said membrane. The anode and cathode include a gas diffusion layer and a catalyst layer. The claim requires that the amount of hydrogen ion conductive polymer electrolyte in the catalyst layer is large at the side of said membrane and is small at the side of said gas diffusion layer and also that the electrolyte varies seamlessly in a thickness direction. Claim 8 requires that a catalyst layer is formed in which the amount of electrolyte varies seamlessly in a thickness direction by spraying inks from different nozzles.

Tomoyuki does not teach or suggest a catalyst layer in which hydrogen ion conductive polymer electrolyte varies seamlessly in a thickness direction. For at least this reason, Tomoyuki does not anticipate independent claim 1 or its dependent claims.

Independent claim 4 now requires that the catalyst layer comprise a layer which is not in contact with the hydrogen ion conductive polymer electrolyte membrane and which consists of a hydrogen ion conductive polymer electrolyte.

In contrast, Tomoyuki does not teach at least this feature. For example, Tomoyuki does not disclose an intermediate layer which consists of a polymer electrolyte only. Accordingly, it is respectfully submitted that claims 1-2 and 4-11 are not anticipated by Tomoyuki.

Rejection under 35 U.S.C. 103

Claims 4-7 were rejected under 35 U.S.C. 103(a) as being obvious over the combination of Tomoyuki with JP 09-245801 (the "'801 application"). The rejection is

traversed and it is respectfully submitted that claims 4-7 are patentable within the meaning of 35 U.S.C. 103(a).

As noted above, claim 1 requires that the amount of the hydrogen ion conductive polymer electrolyte varies seamlessly in a thickness direction of the anode or the cathode. According to the specification, this feature provides advantages to the catalyst layer. For example, on page 18, second full paragraph, Applicant describes that this feature mimics a distribution similar to a dendritic structure extending toward the gas diffusion layer side from the polymer electrolyte membrane side. Accordingly, ions and electrons can move smoothly in a thickness direction of the catalyst layer. In order to turn the distribution of the polymer electrolyte in to one which is similar to a dendritic structure, for example, it was found that two kinds of inks (which have different mixed ratios of catalyst particle and hydrogen ion conductive polymer electrolyte) should be sprayed simultaneously from different nozzles. This can be achieved by spraying from opposite directions. (See e.g., page 18, lines 3-11; Example 4; and Fig. 4). According to the method of claim 8, the distribution of the polymer electrolyte varies more smoothly and more seamlessly than the method of applying two of more kinds of inks sequentially on the surface of the gas diffusion layer. As a result, ions and electrons flow smoothly in the thickness direction of the catalyst layer.

Although certain references may have alluded to varying the ratio of catalyst particles to hydrogen ion polymer electrolyte in a thickness direction of a catalyst layer to improve the mobility of ions and electrons, this goal, in reality, has been extremely difficult to implement. Applicant describes these difficulties in the Background section of the present specification on page 5, around line 18 to page 6, line 7. It is even more

difficult to seamlessly vary the structure of the catalyst layer by conventional methods. Thus, although there has been a long felt need for the structure described in the claimed subject matter, success has proved illusive.

Neither Tomoyuki or the '801 application suggest seamlessly varying the amount of the hydrogen ion conductive polymer electrolyte in the thickness direction of the catalyst layer. Further, neither of these references acknowledge the benefits obtained by the distribution of the hydrogen ion conductive polymer electrolyte which varies smoothly and seamlessly. Indeed, Tomoyuki teaches forming a catalyst layer in a step wise manner.

Additionally, neither reference teaches or suggests, alone or in combination, a method of forming a seamless catalyst layer, let alone by spraying a plurality of inks from different nozzles. For example, Tomoyuki describes in column 6, lines 4-8, that its catalyst layer is obtained by repeatedly applying suspensions of different mixed ratio compositions or containing different materials to the diffusion layer surface several times over. However, Tomoyuki says nothing about applying these inks by spraying them through nozzles.

Applicant has submitted a certified translation to certain portions of Tomoyuki in an IDS of June 30, 2004. In paragraph 13 of the translated Tomoyuki, a catalyst support layer is disclosed having a large ion exchange resin on one side and a small amount on another side. However, Tomoyuki does not suggest seamlessly varying the amount of the hydrogen ion conductive polymer electrolyte in the thickness direction of the catalyst layer.

Further, the present specification provides data showing improved results for the claimed subject matter. For example, a comparison of unit cells A2 to B2 to C2 in Figures 5 and 6 shows that a unit cell having a catalyst layer, which comprises a seamlessly varying amount of hydrogen ion conductive polymer electrolyte in the thickness direction of the catalyst layer (unit cell A2, Example 4) provides a higher current density for a given voltage (Fig. 5) than a unit cell having a catalyst layer, which comprises a varying amount of electrolyte in a stepped or layered arrangement (unit cell B2, Example 5). Both of these cells are an improvement over a unit cell that does not vary the electrolyte at all (unit cell C2, Example 6). It is respectfully submitted that the cited art does not recognize nor appreciate the advantages of the claimed structure and, thus, would not have expected the beneficial result that the claimed structure provides. Accordingly, the data in the specification shows the non-obviousness of the claimed subject matter.

Based on the foregoing, it is respectfully submitted that one of ordinary skill in the art would not have been motivated to realistically modify the references to arrive at the claimed subject matter. Accordingly, reconsideration and withdrawal of the rejections are respectfully solicited.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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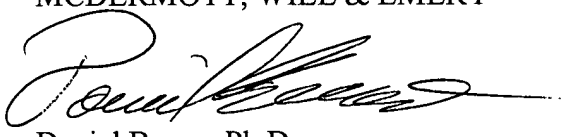

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